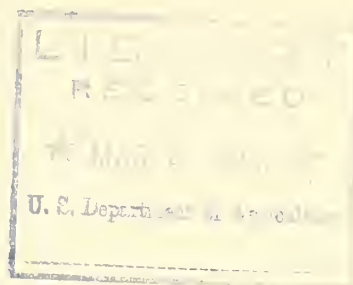


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THE COMMON BARBERRY AND THE BLACK STEM RUST

Radio talk by Dr. C. R. Ball, senior agronomist in charge, Office of Cereal Investigations, Bureau of Plant Industry, U. S. Department of Agriculture, Washington, D. C., given at Kansas City, Mo., from Station WDAF, The Kansas City Star, December 31, 1925.

THE
FOLLOWING
TABLE
GIVES
A SUMMARY
OF THE
RESULTS
OBTAINED
IN THE
EXPERIMENT
CONCERNING
THE
EFFECT
OF THE
TEMPERATURE
ON THE
RATE
OF
REACTION
BETWEEN
SODIUM
HYDROXIDE
AND
SODIUM
CARBONATE
IN
AQUEOUS
SOLUTION
AT
DIFFERENT
TEMPERATURES
AND
CONCENTRATIONS
OF THE
REACTANTS

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Let me tell you the story of the common barberry bush. It concerns every man, woman, and child within the sound of my voice tonight. The common barberry bush spreads the stem rust of wheat. Wheat makes our flour. Whatever destroys our wheat takes away our daily bread.

History of the Common Barberry in America

Once upon a time, more than 200 years ago, the early colonists along our Atlantic Coast brought the barberry bush with them from their homes across the sea. They loved it for its bright red berries hanging in drooping clusters during the long snowy winters. They liked it also for the jelly, the herb tea, and the dye stuff for homespun which it furnished. Little did they dream of the penalty which their descendants would have to pay.

As settlement advanced across the Appalachians and out over the Mississippi Valley, the barberry bush was carried westward. Other plants took its place for jelly, for tea and for dye, but it still was a beautiful dooryard shrub and a spiny hedge to turn the cattle.

It has long been known that this common barberry caused injury to wheat. Nearly 200 years ago, farmers in Massachusetts noticed that their wheat was blasted near barberry hedges. In 1755 a law was passed requiring that such hedges be destroyed. The colonists did not know why the bush was injurious.

They saw only the effect it caused. About 60 years ago scientists proved the real connection between the common barberry and the stem rust of wheat.

Life Story of Black Stem Rust

The life story of the black stem rust is a most amazing tale. You all know the story of the four stages of the butterfly and other insects. First the egg, then the worm, next the chrysalis or pupa, and finally the adult. Many fungi also have more than one stage. Fungi are tiny plants which live as parasites on other larger plants. The stem rust is one of these parasitic plants and it also has four stages. This rust plant lives over winter in the north in the form of black spores on straw and stubble.

In the spring these black spores germinate and produce tiny white spores. This is the first stage of stem rust. These white spores blow about on the spring breeze. If they fall on the common barberry they produce clusters of small cup-shaped bodies. This is the second or cluster-cup stage. These cluster cups break open and their yellow spores blow about.

When a yellow spore falls on a wheat stem, or on wild grasses, it germinates and produces a red spot or pustule. This is the third or summer stage, called red rust. Many people think the red rust is harmless but it really is the third stage of the terrible black rust. These pustules break and millions of red spores are released. They blow about and start more rust wherever they germinate. A new crop of these red spores may be produced every week or ten days if the weather is warm and moist. The rust then spreads like wild-fire.

A little later, as the wheat plants begin to mature, the rust fungus produces the fourth stage, the black or winter spores. This is the black stem rust which everybody dreads. It saps the strength and shrivels the

kernels of the wheat. These black spores live through the winter and start the rust again on the barberry in the spring. They can not start rust on grains or grasses but only on the common barberry. The Japanese barberry is harmless and may be planted, for it does not carry rust.

Let me repeat! First stage white, on stubble and grasses. Second stage yellow, on common barberry only. Third stage red, on wheat and other grains and grasses, repeating as long as the weather is favorable. Fourth stage black, on grains and grasses, and overwintering on stubble and dead grass.

Stem Rust Epidemics

In 1904 an immense epidemic of stem rust swept over the North-central States. It caused an enormous loss to farmers and through them to every eater of wheat bread. Even in ordinary years, the average losses are estimated at about fifty million bushels of wheat every year. This is a heavy tax to pay. In 1916 came another terrible epidemic. It is estimated to have destroyed nearly two hundred million bushels of wheat in the upper Mississippi Valley, besides a great loss in Canada. Our wheat was sorely needed then to feed the armies of the allies in Europe. This rust epidemic caused a loss of hundreds of millions of dollars to American farmers.

The Eradication Campaign

As a result of this enormous loss of wheat, a campaign was started to eradicate the common barberry in the great region where rust losses had been so heavy. This campaign began on July 1, 1918, and has continued with increasing vigor ever since. It is a gigantic enterprise, covering an area more than 1,500 miles along by 700 miles wide. It includes thirteen North-central States, from Ohio and Michigan on the east to Colorado, Wyoming and

Montana on the west. It is conducted as a great cooperative project. The agencies chiefly concerned are the U. S. Department of Agriculture, the State Colleges of Agriculture, and the State Departments of Agriculture. To these are added the public school system, private educational institutions, nurserymen, farmers' organizations, groups and organizations of business and professional men, and many others. One of the most helpful of these has been the Conference for the Prevention of Grain Rust, composed chiefly of business men in Minneapolis and St. Paul and agricultural leaders in the North-central States.

Nurserymen were asked to destroy the tens of thousands of bushes they had for sale. Property owners in town and country were asked to kill the bushes they prized. The first step was to tell the story of the common barberry and black stem rust to the thirty millions of people in these thirteen States. A great publicity campaign was required. Thousands of articles have been published in city and village papers, and farm journals. Talks and lectures have been given by the hundreds. Bulletins, pamphlets and pictures have been sent out by the millions. Lantern slides and motion pictures have been in constant use. Posters have been widely displayed in public and private buildings. Demonstrations and exhibits have been made at State and County fairs. No scientific fact has been told more widely or received more readily. Splendid cooperation has resulted.

Problems of Eradication

Barberry eradication has not been all joy. When the campaign began, it was thought that the bushes were mostly planted for ornament in cities and towns, with a few hedges on farms. The earliest survey on the farms and in

the woodlands showed that this idea was all wrong. Only about $2\frac{1}{2}$ millions of original bushes have been found in cities and towns, while more than $9\frac{1}{2}$ millions of bushes, old and young, have been located in the rural districts.

Where did all these bushes come from? Those in the cities, towns and villages were planted for ornament. Some of those in the country had been planted for ornament or for hedges, but most of them were escaped, or running wild, as we say.

When barberries get to be a few years old they begin to produce an abundance of berries. Many kinds of birds eat these berries greedily, especially in winter when other food is scarce and the bright red berries are easily seen. Wherever the birds roost in groves, orchards, thickets or woodlands, the seeds have been dropped and seedlings have appeared. This has been going on for more than one hundred years in the older States of the area. Millions of these seedlings grew to be fruiting bushes in their turn and have started new crops of seedlings. The worst areas of these escaped bushes have been found in the rolling timbered portions of Ohio, Wisconsin, Illinois, Minnesota and Iowa. Nearly half a million plants of all ages were found in one small piece of rocky wooded bluffs along the Mississippi river in Wisconsin.

It is no easy job to find all these millions of escaped bushes, especially the tiny seedlings coming up among the dead leaves, weeds and grasses. The bushes are found along fence rows, in brushy pastures, in clumps of shrubbery, in thickets, in open woodlands, in weed patches and along stream banks. Sometimes they stand boldly in the open, sometimes they are completely hidden by other vegetation, but the field assistant has to find them, whether big bushes or tiny seedlings. When he has found them he has to kill them so they will stay dead.

This proved to be a real problem. When the work started over $7\frac{1}{2}$ years ago, we dug the bushes with spade and mattock, or pulled them out by the roots with teams or tractors. We thought that would kill them, but it didn't. Every little piece of root or root-stock left in the soil sprouted promptly. Dozens of sprouts came up where one bush had stood before.

Then began a long hunt for chemicals which would kill bushes so completely that there would be no sprouts. After trying about forty different chemicals, just two, common rock salt and kerosene, were found to do the business cheaply, surely and safely.

Results of the Eradication Campaign

The eradication campaign has been long and hard, but the end is beginning to appear. The thirteen States contain 976 counties, of which about 900 required survey to locate and destroy common barberries. The first original survey has been completed in nine States: Colorado, Indiana, Iowa, Minnesota, Nebraska, North Dakota, South Dakota, Wisconsin, and Wyoming. These States contain about 840 counties. There still remain about 60 counties to cover in the four remaining States. Of these 30 are in Illinois, 10 in Michigan, 15 in Ohio, and 5 in Montana.

A second complete survey has been found necessary in some of the worst counties, especially those done in the early years when the men were inexperienced. About 167 counties already have been covered by this second survey and about 65,000 bushes missed in the original survey have been found and destroyed. The complete records show that the men found about 92 per cent of the bushes in the original survey and the other 8 per cent in the

second survey. Many of the 8 per cent missed had been cut off before our men came and they could not find the cut stems among the weeds and grasses. Later these cut stems sprouted and these sprouts betrayed the location.

Resurveys to find sprouts and new seedlings will be necessary for several years. If these sprouts and seedlings are allowed to develop they will start rust again. If they are allowed to become old enough to produce seeds, birds will scatter them again over the pastures and woodlands which have been cleaned. Then the whole long and expensive job will have to be done over again.

In the entire campaign of 7½ years, 6,501,000 original bushes, 5,309,000 seedlings and 290,000 sprouting bushes have been found. This makes a grand total of 12,100,000 bushes of all kinds, or more than one bush for every three persons in these thirteen great States. The total amount expended by the United States Department of Agriculture in this work to date has been a little more than \$2,000,000.00. State and private agencies have contributed about \$545,000 more. Therefore, more than 12,000,000 bushes have been found and recorded, and most of them killed, at an average cost of less than 22 cents per bush.

About 11,556,000 of these bushes and seedlings have been destroyed. This means that during these seven and one-half years about 128,400 barberry plants have been killed in every month, 4,222 in every day, 176 in every hour, or nearly 3 in every minute. Let me repeat. From the time this campaign began until the present minute, day and night, week days and holidays, winter and summer, a barberry plant has died in every 20 seconds. In the minute while you tie your necktie, or powder your nose, in the morning, three bushes have perished. In the hour while you go out to lunch 176 bushes have gone.

Every time the sun rises it sees 4,222 fewer barberries than on the day before. While you took your month of vacation, 128,400 barberry bushes disappeared forever.

Cooperation

What is your part in this great work, my friends? Four things!

1. Teach the story of common barberry and black stem rust to your friends and neighbors.
2. Stand behind the Federal, State, and private appropriations to finish this big job.
3. Learn to know the common barberry bush and to hate it as you would a rattlesnake.
4. If you find one anywhere in these thirteen States, report it at once to your State Agricultural College or the United States Department of Agriculture. They will tell you what to do with it.

Your helpful cooperation is greatly appreciated. I thank you, and wish you a happy New Year.